



Colony of Seychelles.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

YEAR 1931

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1932.

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General Remarks.

There was no change in the staff during the year except that the Excise Inspector was for the last 3 months transferred to the Public Works Department. Arrangements were made departmentally to replace him during his absence. The scale of salary being higher in many other departments, the subordinate officers of the Agricultural Department are naturally inclined to obtain a transfer, sometimes after considerable training, which thus becomes useless.

Besides supervision of a Botanic Station which includes Hermitage estate and covers 35 acres of land, the Director of Agriculture continued as usual upkeeping several small town gardens; re-forestation of the crown lands of Niol and Praslin; exploiting timber for the Public Works; inspecting estates in connection with coconut diseases, experimental manuring and cultivation; working a Licensing Board and a Fisheries Committee, and running a small Excise Department. He is also a member of the Executive and Legislative Councils.

The laboratory work had to be left to Mr Nageon de Lestang who was engaged during the year in breeding insect parasites and analysing soils, manures and essential oils as far as the limited equipment of the laboratory allowed these various works to be carried on. The laboratories are being gradually and slowly better equipped. Small islands like Seychelles have their own problems to solve, which are in many cases so different from the problems of research work with which continental areas are concerned. But the proper means of equipping laboratories will always remain deficient in Seychelles from want of funds and it is hoped that at least many of the local problems will be solved with the assistance of the authorities at Amani in Tanganyika when the work of that Research Institute is in full swing.

Mr Nageon who is also in charge of the Experimental manuring carried out a few rough tests for the determination of the PH value of our soils and found approximately the following figures:—

1. PH value of 7.75 to 8 in the soil of the coral plateaux
- " 7. " 7.50 in the soil of the silted plateaux
- " 6.50 " 7 in alluvial soil alongside river bank
- " 6. " 6.50 in well manured granitic soils
- " 5.25 " 5.50 in the lateritic mountain soils.

II. Work in the gardens and observation on plants.

The avenue leading to the central lawn was set out with additional rare palms such as *Medenia* from Madagascar, *Washingtonia*, from N. America, *Thrinax*, *Coccothrinax*, *Pritchardia*, *Corypha*, *Licuala* &c. from various countries. In order to brighten the appearance of this central avenue pending the growth of all the palms the following climbing or procumbent flowering shrubs were interplanted between the palms; *Petrea*, *Bougainvillea*, *Quisqualis*, *Poivreia*, *Bignonia magnifica*, *Duranta*, *Bauhinia* sp. *Passifloras*, *Tristillietia*, *Mussaenda*, *Antigonon*, *Allamanda* (violacea and grandiflora) *Congea*, &c. Another footpath was built alongside the Trois Frères River in order to allow visitors to use a shaded walk from one end of the garden to the other. Rare plants such as rattan canes, Madagascar *Takamaka*, W. Indian Mahogany, *Chrysophyllum cainito* (star apple), *Couroupita Guineensis*, *Dillenia indica*, *Corypha* palm &c. were also set out along that walk.

Among the plants which fruited or flowered for the first time the following may be mentioned:—

Inocarpus edulis, *Passiflora laurifolia*.
Brownea capitellata, *Psidium friedrichsthalianum*.
Attalea cohune, *Lucuma salicifolia*.
Kigelia Africana, *Macadamia ternifolia*.
Parmentiera cerifera, *Monstera deliciosa*.
Bauhinia Galpinii with a flower like a nasturtium.
Phyllanthus distichus.
Glycosmis citrifolia, *Casimiroa edulis*.
Rollinia mucosa, *Strophanthus dichotomus*.
Eucalyptus corymbosa, *Prosopis juliflora*.
Amoora rohituka.
Terminalia arjuna.
Melampodium devaricatum a small *S. American* *compositae* first found growing wild at La Digue Island.

The following *Cassias* flowered as usual *multijuga*, *javanica*, *fistula*, *occidentalis*, *nodosa*, *florida*, and *grandis*. *Cassia multijuga* flowered twice during the year and is spreading everywhere in the garden, it will soon get established all over Mahé.

The two grafted mangoes from India Alphonso and Pereira (Pairi) gave a few excellent fruits. The drought of nearly 8 months' duration caused local mangoes to flower more abundantly this year. Fruits were left unplucked on the trees except those from the best varieties. Much attention was given to grafting and layering during the year for the replacement of bad varieties of mangoes and other fruits.

Avocado pears also fruited well, the small Mauritian variety from Grandport being very much appreciated owing to the firmness of its meat. West Indian varieties were introduced from Jamaica during the year.

Rambutan, *Nephelium lappaceum*, fruited twice in March and December which are the two periods of greatest vegetative activity in Seychelles. This fruit is worth being propagated as a substitute for litchi which fruits very seldom in the Colony except occasionally above 1,400 feet elevation. Santol (*Sandoricum Kotjape*) produced an abundance of fruits in the garden which was the cause of a large number of school boys coming over every day to feast on these and other fruits. It seems that the planting of fruit trees in Seychelles is for that reason a necessity, the school boys having by instinct or otherwise developed a sense of pilfering which is beyond ordinary powers of supervision.

As usual much attention was paid to the introduction of new palms, as this colony is very suitable for the growth of these plants, which predominate in the jungle, to the almost exclusion of other species.

The following is a list of the palms of which seeds have been secured mainly through the instrumentality of the Economic Botanist, Kew Gardens.

<i>Phoenix reclinata</i>	<i>Raphia vinifera</i>
<i>Pinanga disticha</i>	<i>Calamus Cæsius</i>
<i>Metroxylon sagu</i>	<i>Caryota Griffithii</i>
<i>Astrocaryum tucuma</i>	„ <i>mitis</i>
<i>Mauritia speciosa</i>	<i>Chrysalidocarpus Madagascariensis</i>
<i>Maximiliana regia</i>	<i>Cyrtostachys lakka & renda</i>
<i>Oenocarpus Bataua</i>	<i>Dæmonorops palembanica</i>
<i>Ginliolma speciosa</i>	<i>Licuala elegans & Rumphii</i>

An attempt has been during the last few years to introduce more fir and allied trees in the Colony where they were non existent.

The following have succeeded:—

<i>Araucaria</i>	<i>Cookii</i>
„	<i>Bidwilli</i>
„	<i>excelsa</i>
„	<i>Cunninghamii</i>
<i>Juniperus</i>	<i>Bermudiana</i>
„	<i>procera</i>
<i>Casaurina</i>	<i>quadrivalis</i>
	<i>Cunninghamii</i>
	<i>glauca</i>
	<i>torulosa</i>
	<i>leptoclada</i>
<i>Thuya orientalis</i>	
<i>Cryptomeria Japonica</i>	
<i>Cupressus pyramidalis</i> , <i>torulosa</i> , <i>macrocarpa</i> , <i>Penthami</i>	
<i>Calitris quadrivalvis</i>	
<i>Pinus pinza</i>	
„ <i>longifolia</i>	
<i>Agathis robusta</i>	

Most of these conifers do well in the Botanic gardens except the pencil cedar and the two species of *Pinus* which will be removed to the mountain reserves when they may in time be required for sheltering plantations of the rare endemic trees that are being established.

A special section of the garden has been devoted to fibre plants of the *Amaryllidaceae* family among which the following may be mentioned :

Agave sisalana
 „ *americana*
 „ *furcroyoides*
 „ *Cantala*

Furcroya gigantea and its subvariety *Wilmetiana*.

These plants succeed very well here either in the fissured coral islands rich in mineral elements, or on the slopes of granitic mountains where there is not much soil left for other economic plants. The publication of an official hand guide of the gardens is under consideration. The number of plants (including rare specimens) have reached a respectable figure and it would be a pity if several of these plants were to be left to take care of themselves or otherwise injured by mistake. The labelling of these rare plants has been done several times over but as usual the labels are shifted from one plant to another by labourers, and the present trained staff is too small to have the labels constantly put back in their proper places. The Superintendent of Public Works has been requested during the year to draw a botanical chart of the gardens which will be included in the hand guide.

Among shade trees and cover plants which are so essential in the colony for the preservation of humus and the checking of erosion it may be mentioned that *Albizia moluccana* produces an unrivalled amount of mulch, *Acacia confusa* and *polystachya* being the next best trees. *Grevillea robusta* makes slow growth. *Albizia fastigiata* and *Gliricidia maculata* give excellent results. *Lucaena glauca* is considered too hardy to eradicate when necessary ; this gives an idea of its good growth.

Among bushes *Tephrosia*, *Crotolarias*, *Indigoferas* and *Cajanus* are very quick growing but they have all to be replanted every year as they are badly attacked by *Leerya* bugs and *Aulacaspis* scales.

The best ground cover plants are decidedly *Indigofera endecaphylla* and *Centrosema pubescens*, all the others under experiments are very sensitive to fungus disease bad weather and poor soil conditions and make insufficient growth. *Indigofera endecaphylla* is besides a fodder plant.

The local *desmodium* (*D. heterophyllum*) is very successful when the soil is rich but in poor soils it makes no cover at all. *Alysicarpus nummularifolius* growing along roadside is under observation.

Better advantage will probably be taken of cover plants where they will become better established after manuring. For the present they all (including local *desmodiums*) make insufficient growth, except *Indigofera endecaphylla*, to be of use as green manures.

III. Expenditure, Receipts, sale of plants &c.

		Rs	c
Receipts from plantations	...	975	61
Sale of timber from Crown lands	...	298	67
Rents on Crown lands and buildings	...	21,378	39
Royalty and export duty on guano	...	9,701	00
Royalty on timber from Aldabra	...	118	96
Total Receipts	...	32,472	63

The total expenditure under agriculture and crown lands amounted to Rs 33,101.72.

It should be remarked that the revenue derived from the sale of milk to the Hospital is not included in the receipts and that timber and firewood from crown lands are delivered free to the Public Works and other departments. The question of debiting the Public Works Department with the total value of the timber is under consideration.

On the expenditure side, the premium on rat tails which reached Rs 4,593.49 cents in 1931 was debited to the Agricultural Department. Re-afforestation work to the amount of Rs 3,000 per annum also forms a large part of the expenditure incurred during the year.

Chapter IV.

Visit by Mr F. A. Stockdale, C.B.E., C.M.G., F.L.S.

The Agricultural Adviser to the Secretary of States for the Colonies.

During Mr Stockdale's tour of South and East Africa he was able during February 1931 to devote a few days to a visit to Seychelles.

The results of his investigation in this Colony are included in his general report C. A. C. V. I. I. published by the Colonial Advisory Council of Agriculture and Animal Health at the Colonial Office.

The Right Honourable the Secretary of States authorised publication locally of that part of the report concerning Seychelles.

The supplementary report by Mr Stockdale on the financial assistance to Agriculturists in Seychelles was published locally in the Government Gazette No. 38 of August 27th, 1931.

V. The Coconut Industry.

According to the trade returns the quantity of copra exported amounted to 5,474 tons in 1931 including the shipments in January 1932, to the amount of 592 tons, which evidently belong to the crop for 1931.

The exportation for the last 5 years is as follows:—

	1927	1928	1929	1930	1931.
Tons ...	4,847	4,885	5,485	5,460	5,474

The copra exported represents 38,138,000 nuts. Nuts exported as such amounted to 45,717. It is further calculated that 1,032,409 nuts were converted into coconut oil for exportation and for local consumption, including the oil used for soap manufacture locally and that 4,000,000 nuts were otherwise consumed directly as an article of food. The crop for 1931 may therefore be reckoned roughly at 43 million nuts.

This crop compares favourably with the two previous ones in spite of the drought which prevailed for the last 3 years, 1929, 1930 and 1931 and which was so severe during the year under review that only 33 inches of rain fell between March and November. It is in 1928 that the rainfall was exceptionally high amounting to 135 inches. Since then it ~~has~~ remained below the average which is 96 inches, for 3 years in succession. The drought reminded me of that which was experienced during the period 1907—1911 when the rainfall remained all that time below the average. From 1912 to 1928 the rainfall never remained below the average for more than 2 years in succession, a period of heavy rainfall always following a shortage in the preceding year. The evil effect of the 3 years drought was however felt during the year in a great many localities where a decrease in the crop was felt severely and is still felt at the time of writing (February 1932). I am afraid that these repeated periods of drought will very likely tell heavily on the crop for 1932. This is in accordance with the behaviour of the crops of coconut palms which are more affected by adverse conditions happening 2 or 3 years before than by those of the year during which the crop is harvested. The drought has however never assumed for the last 3 years such a virulent character as to cause the wilt disease, which is an accompaniment of the shortage of water in the soil and from which Trinidad and Ceylon and East Africa are sometimes suffering so heavily. That wilting of the palms occurred in Seychelles during the drought of period 1906—1911; and it is fortunate that it did not recur during the present drought.

In December 1931 the rain started to fall so abundantly that 60 inches were recorded in two months. In periods of drought the tissues of the tree become soft and wilt as there is not enough water to keep them turgid. On the other hand, insufficient drainage in low lying districts has the same effect, the roots dying out and not supplying enough water to the tissues owing to waterlogging and want of aeration of the soil. The draining of the so called ~~marshes~~ is still postponed. A demonstration at Government expense should be made to show the effects of the Armo pipes with automatic gates so often recommended. Planters drain these marshes by making upraised beds 50 feet wide and intervening large channels at a cost of over Rs 450 an acre and only a few of them can afford to do this.

The above figures go to show that by improving cultural methods including drainage and manuring the coconut crop would be considerably increased, it having not fell short of that of the years 1926 and 1930 which were considered as record crops. In spite of scale insect havoc, mostly that caused by *Ischnaspis filiformis* in the low country where the other scale *Pinnaspis buxi* is fast disappearing, many plantations looked healthier than before.

The lower price paid for coconut locally during the year which varied between Rs 15 to Rs 29 instead of Rs 40 which was the price paid during the previous 25 years, naturally led to an inconsiderate reduction of the working expenses on most estates. The wages of labourers were wisely cut down by 33o/o on some estates without reducing the number of labourers. It is calculated that the cost of cleaning an acre twice amounts to Rs 7.12; that of packing, and other expenses amount to Rs 1.39 or a total of Rs 8.50 at the present time. This leaves a margin of profit of about Rs 17 per acre with a crop of only 1,000 nuts sold Rs 30. Should the crop be increased 2 or 3 times over, as it has already been done, on many estates by manuring, the position of the coconut industry in the colony would be far better. No other industry has as yet been found to replace it as with coconuts the working expenses per acre can be reduced with impunity without dislocating the plantations beyond recovery, a feature which is not common to most other tropical crops. Coconut palms in Seychelles have been known to survive in a jungle of casuarina for 40 years and to recover luxuriantly after that time on cleaning the jungle. This power of resistance to adverse conditions of growth fully justified the conclusion that one can arrive at in saying that so long as these conditions will remain the same, there will be no room in the low country of this colony for any other industry except the culture of these intercalary crops of herbaceous plants like patchouli and others. Such a great power of recovery is decidedly a proof that oceanic islands of small size are eminently suitable for coconut palms which are there less handicapped by diseases of a permanent nature than in other larger islands and continents.

The following table shows the fluctuation of the sale price of coconut in Seychelles and copra on the London Market during the last 40 years.

1890—1908	Rs 12 to 17	in copra exported
1901—1905	„ 14 „ 22	do
1906—1910	„ 29 „ 40	Rs 280 to 300
1911—1915	„ 40 „ 46	„ 400 „ 500
1916—1920	„ 36 „ 56	„ 500 „ 594
1921—1925	„ 40 „ 45	„ 300 „ 450
1926—1928	„ 40 „ 42	„ 350 „ 280
1929	„ 30 „ 35	„ 300 „ 356
1930	„ 25 „ 30	„ 250 „ 300
1931	„ 15 „ 25	„ 139 „ 230

VI. Essential ~~Crop~~ Oils

There are so many problems to elucidate in connection with the methods of distillation of the various essential oils that have already been produced in the Colony that the appointment for one year towards the end of the year of a specialist who will devote all his time to these questions was most opportune. This will enable the Department to carry on experimental work on a new basis as it has been found that besides proper methods of distillation which are necessarily variable according to the material distilled there are certain other agricultural factors that have to be closely examined in order to explain peculiar results obtained in the past. These results do not depend entirely on wrong methods of distillation. They may also depend on wrong methods of cultivation and cropping. With an expert distiller at hand and a distillery attached for the first time to the Department it will be easy by proper and timely methods of distillation to alter, if experimental work leads that way, those methods of cultivation or cropping which may entirely be the cause of bad results. At the present time for example, many people think that the yield of cinnamon leaf oil per ton of leaves should be over 12 litres while many distillers are convinced that if the leaves are not allowed to remain on the plants for several years in succession this yield of 12 litres is out of question, leaves reaped every 6 months yielding 5 litres while leaves reaped every year yield 7 litres. I am in possession of figures forwarded to me in 1924 by a planter who obtained from leaves gathered for the first time in the jungle an average yield of 11.8 o/o for several months in succession without the daily yield being inferior to 11 o/o at any time. The age of the leaves at which they are reaped seems to be the predominant factor governing the yield, although one often hears that it is the method only of distillation that is at fault. It is only a whole time specialist who can arrange extensive experiments to settle this point economically, by distilling leaves at different time of the year and at various intervals between two successive croppings in the same still worked in the same way. There are records at the Imperial Institute of cinnamon leaves yielding 15 and even 30 o/o. On the other hand if too much time is made to elapse between two successive croppings cinnamon leaf oil will cease to be a paying proposition in the face of its competitors and substitutes.

The vexed question of differentiating between palmarosa and ginger grass in the field is also dependent on direct experimentation by distilling the two grasses from various districts at various times of the year and intervals between croppings as the two plants, both from seeds and from shoots were introduced at the same time in 1923 from India while I was a ~~vay~~ in Mauritius and it may be that it is the natural cross breeding of the two varieties, which are botanically undistinguishable, that has caused irregularity in the percentage of geraniol contained in oils obtained from the same locality from plants having apparently the same perfume and the same origin. The introduction of Motia plants of genuine type only should have been attempted and not plants of the Sofia varieties. One has to be a distillery expert to distinguish by the smell of the two varieties that are so closely allied and which after all may cross breed and upset the greatest care in propagating one plant to the exclusion of the other. The only guide is the smell of the leaves at present but another test of more precise by distillation or otherwise has to be found. The seeds of both varieties are fertile and are scattered about at long distances. Besides the probability that the varieties interbreed there are striking differences in the habits of growth which were once considered a sign of distinction but which fortunately is common to both varieties that are neither ~~procumbent~~ or erect. The soil and climate may have also some influence on the geraniol content of the mixed grasses. On one estate a sample was found in 1927 to contain 80 o/o and pronounced to be palmarosa oil while plants taken from the same estate and from the same clumps and transplanted elsewhere recently gave a sample containing 65 o/o only which was pronounced to be of the ginger grass type with high geraniol content. It is however fortunate that the two oils are both fetching a high price on the European market, with a slight difference in favour of palmarosa, so if it is a mistake that seeds of the two varieties were intermixed at the time of introduction in the Colony in 1923, and that the two plants are now growing side by side everywhere, the oil produced by a mixture of the two varieties is however still a paying proposition I have been unable to ascertain as yet if in India the two varieties which are said to grow at two different altitudes do not interbreed and give by distillation a mixture of the two oils. I am however informed that the climatic and soil conditions have much to do in the distribution in the wild state of one variety in one locality to the exclusion of the other. It is also necessary that the distillery specialist should work out the right method of distilling patchouli in order to produce an oil that is more readily soluble in alcohol than that which has been manufactured hitherto. Solubility in alcohol of Seychelles patchouli oil is known however to have gradually approached that of Penang oil. There is no doubt that we have in Seychelles the true Patchouli (P. Cablin) and that climate and soil factors

have again slightly altered the composition of the oil obtained but in order to clear out this important point it has been decided to eliminate climatic factors experimentally and to see whether patchouli from Ceylon of the right Singapore type which is on its way to Seychelles will produce oil in Seychelles similar to the alleged more soluble Penang oil. Distillation methods alone have hitherto been incriminated but other factors have also to be eliminated before arriving at such a conclusion.

There are other perfume plants that are more or less of variable character in the Colony and which await investigation by the full time specialist whose experiment may lead to very profitable results in the near future.

Although many distilleries were closed down the exportation of essential oils from the Colony during the year under review amounted to :—

		1930.	1931.
Cinnamon leaf oil litres	...	50,478	54,793
" bark " "	...	nil	3
Patchouli " "	...	2,341	3,915
Basilic oil "	...	23	12
Cinnamon bark kilograms	...	nil	38,816

Towards the end of the year a collective Marketing Committee was appointed by His Excellency the Governor to report on the best method of selling cinnamon leaf oil produced in the Colony. Several meetings of the committee were held and although the matter is still under consideration it has been decided to draft an ordinance on the lines of the St Vincent Arrowroot Ordinance which seems to be admirably suited to local conditions, "*mutatis mutandis*". There are only 5 cinnamon leaf oil exporters and dealers in the Colony while the producers number 86. It would not be difficult with Government assistance to arrive at some sort of cooperative association which is so badly needed in Seychelles in this and other directions.

VII. Minor Industries.

As usual a good deal of first hand information was received from all Imperial Agricultural Bureaux with the promptness and precision which are the characteristics of these institutions.

Ambrette seeds. From the Imperial Institute it was ascertained that prices fluctuate too wildly to allow the production of these seeds being recommended. The variation in price in London is from 3d up to 5s per lb. The tendency in the replacement of ambrette oil by artificial musk also goes far, according to information received, to cause that great fluctuation of price.

Cashew nuts....Cashew in the drier climate of the Praslin group of islands is a subspontaneous plant often used as props for vanilla. It was ascertained from the Imperial Institute that these nuts for which there is a demand in England for dessert purposes should be decorticated and that the kernels in their natural state would fetch about 55/ per cwt. Cashews are also peeled and bleached in the United Kingdom and exported to America where they are quoted at 100/s. These articles are however sold in competition with other nuts of South Europe which are generally preferred on the market.

Cinnamon leaf oil.—Information was obtained from the Imperial Institute showing that the demand for this article in Europe had fallen considerably during the year. Eugenol-vanillin derived from cinnamon leaf oil and from clove oil is now superseded in Europe by guaiacol vanillin derived from phenol which is cheaper notwithstanding an import duty of 33o/o on the latter in the United Kingdom. Vanillin is also being made from Safrol which is produced in Japan from camphor wood oil at a very low price. There is still a demand for cinnamon leaf oil on the American market and it is believed that this is due to comparatively higher customs duties being levied ~~thereon~~ its competitor: Clove oil. The position of cinnamon leaf oil is therefore more and more seriously affected. As its other uses are limited, it being also inferior to Ceylon leaf oil in fineness in flavour and odour. Steps are being taken as stated in another chapter to improve the manufacture and sale of Seychelles cinnamon leaf oil of which some 50 to 60,000 litres are produced per annum.

Patchouli oil.—The Imperial Institute also supplied a report showing that production was overtaking the demand during the year, and that an article of better quality was produced in Java, India and Malaya. The character of the Seychelles oil which had formerly a bad reputation regarding solubility in alcohol, was examined lately at the Imperial Institute and the samples obtained in 1931 were found to approximate very closely in solubility to Singapore oil.

Castor seeds are produced mainly in India, Brasil, Dutch Indies, China and Tropical America. They are exported to Europe and converted into oil which is mainly used for lubricating the delicate engines of aeroplanes in preference to other oils which solidify more quickly in the cold atmosphere. Castor oil is besides used medically and also for soap manufacture. It is however of special composition and contains 4o/o of Glycerine. So long as its value will remain much higher than that of coconut oil there is no doubt that its culture in Seychelles should be attempted especially in the coral islands where many varieties are subspontaneous and bear much more heavily than in granitic land. It has however been grown successfully in South India in poor red soils. There are so many varieties of this plant that arrangements have been ^{made} for the introduction of the best ones from India to the exclusion of the others. Many varieties already occur here but they have been found experimentally to contain a low percentage of oil as compared with the best Indian varieties. For many reasons the coral islands where the climate is drier are more suitable than the granitic islands for the culture of

this plant which is very susceptible to disease. On these islands the dry season extends over 8 months and the best varieties of *Ricinus communis* treated as annuals and topped when necessary would very likely produce better crops than in the wet districts of the Mahé group where palnts, 8 months old, are known to grow 20 feet high. A selection of the best varieties suitable in turn for the two different groups of islands is desirable. Phosphates and Potash fertilisers are highly beneficial to these plants the ash from the seeds containing a high percentage of these elements viz 38 and 280/o respectively.

Citrate of lime. It was thought advisable for some time to manufacture that article in the Colony by using bigarades (*Citrus mitis*) which is subspontaneous instead of limes but a report from the Imperial Institute was received which went to show that there has been lately a large increase in the production of citrate of lime from pineapple waste in the United States and Hawaii, and that fermentation processes for the production of citric acid (or citrate of lime) from sugar were now working satisfactorily on an industrial scale. The genuine citrate is besides marketed through an organisation at Messina (The Camera Agrumaria). In the face of this information the scheme of putting up a small plant for the manufacture of Citrate at Praslin was abandoned.

All spice. All spice berries were reaped from a tree in the garden roughly dried and forwarded to the Imperial Institute in April last. The fruits were found to be slightly larger than the Jamaica sample in which the remains of the calyx were also less obstrusive. The Jamaica all spice fruits are worth 26s per cwt at present. The price fluctuates however considerably from 20s to 130s. The bulk of the fruits gathered in the garden was however reserved for sowing and about 2,000 plants were raised and distributed towards the end of the year. A larger consignment of fruits will soon be forwarded again for valuation. There are only a few plants of all spice in the garden but one produced an abundant crop. Leaves of other unproductive trees were distilled in a primitive still and the oil was found at the Imperial Institute to be of inferior grade as compared with Jamaica oil which is exported to the amount of 5,000 litres p.a. As the eugenol content of the oil was found to be as low as 630/o it compared unfavourably with that of cinnamon leaf oil and would fetch a lower price on the market. Both oils are sold as a source of Eugenol for the manufacture of vanillin but all spice berry oil is also used for other purposes.

Pepper. Arrangements were made for the introduction of cuttings from the Malay States and Ceylon and India. The cuttings from Singapore and Peradeniya (Ceylon) have already arrived and about 50 of these plants are being rapidly established and propagated by layering. The plants from S. India have not yet arrived and a new consignment is expected from Ceylon. It has been ascertained that the local strains of pepper were shy bearers, the spikes being very seldom fully packed with fruits for the reason that there the monsoon sets in before the flowering season with the result that pollination, already handicapped by a small number of male and of hermaphrodite flowers is interfered with by heavy showers. It is hoped that imported varieties will produce more hermaphrodite flowers and that by cultivation and manuring it will be possible to cause the vines to set forth new growth and flowers a little time before the rainy season which begins here in November as a rule. ~~The Chinese~~ methods of growing pepper on dead posts has been found to be successful here in red laterite soils. The gravelly soils are less suitable. The poles 10 to 12 feet high above ground are soon covered up by a mass of short shoots which flower well and much more than in the jungle where pepper is allowed to grow on boulders. Pepper seeds from Java and Ceylon did not germinate.

Ginger. A few patches of Ginger are grown mostly in S. Mahé but the multitudinous roots are very inferior being very small and constantly throwing up shoots which render curing difficult. The rhizomes introduced from Ceylon and packed in the W. case of pepper cuttings perished in transit. Few rhizomes from Mauritius were also introduced and are doing well. The rhizomes from that Colony are much better than the local ones. Other consignments of Indian ginger are expected. There is always a difficulty in manuring ginger artificially without promoting extravagant growth of the rhizomes before maturity and upsetting correspondingly the curing of the hands. The S. Indian methods of manuring repeatedly with a surface mulch of twigs has been tried with success and the twigs were those of *Phyllanthus niveus* which is common hedge plant in the garden.

Nutmeg. A consignment of nutmegs ordered from Grenade was found while in transit at Kew to be so severely attacked by a *Sphanoderes* beetle that the authorities of that Institute decided to cancel this consignment. Nutmegs of which I found a few specimens at Government House in 1900 were again introduced in 1903 and 1906 from Java, Penang, Ceylon and some of these plants are now in bearing specially at Cascade and Mamelles. Among them a few large seeded varieties are kept for propagation. There are also many plants of the small seeded varieties in the colony. Owing to poor soil conditions except alongside river banks it is not likely that nutmegs will be grown on a large scale in Seychelles. It was found in Penang that these spice trees in poor laterite are very susceptible to boring beetles. Anyhow the plants already grown here are sufficient for the eventual establishment of that small industry.

Tuba. The tuba roots from *Derris elleptica* seemed to yield such a small crop that cuttings of *Derris melaccensis* with a high rotenone content were introduced during the year from Singapore. The cuttings arrived in such good condition that 900/o of them soon became established and are being propagated for distribution to planters. These plants deserve a small place as a minor industry for the exportation of the extract obtained by distillation and for local use as a contact insecticide against ticks, lice, scale insects, caterpillars. It is already of much use in the garden. 1 lb of roots pounded in a mortar and macerated in a gallon of water forms an effective emulsion.

Areca nut. A great number of areca nuts were introduced in 1903 and 1911 from Ceylon and Wellesley province. They have done very well in marshy ground and a few planters in Mahé and Praslin have been recently supplied with seednuts for propagation. During the year a small consignment of about 100 seeds was received from Ceylon and carefully selected by the Director of Agriculture, Peradeniya, among the best new varieties grown in that colony. There is no reason why this palm should not be grown in Seychelles where palms predominate so much in the jungle. It is also desirable to combine the growing of pepper with that of areca nuts, the latter being used as living props for the former.

Tung oil. This colony was supplied during the year with a consignment of *Aleurites Fordii* in 1930 and one of *Aleurites montana* in 1931 through the kind instrumentality of the Director Kew Gardens. The plants of *A. Fordii* have not succeeded both in Praslin and in Mahé either in the low country or on the hills. They remain stunted and lost their leaves during the rains. The plants of *A. Montana* although younger are 4 times taller and have reached 10 feet high in 8 months in the garden. A few trees are being carefully tended for the production of seeds as quickly as possible.

Eucalyptus oil. *Eucalyptus citriodora* was grown from seeds received from S. Africa and Australia and 500 seedlings were supplied during the year to a planter who applied for same. A great number of seedlings were also set out in the garden. These plants are sensitive in the nursery to heavy showers but as soon as they are established in the field and have passed the critical stage they make remarkable growth. A hybrid *Eucalyptus* from Mauritius is also grown in the Colony with success, many trees reaching 25 feet high within 2 years.

Rattan cane. After numerous unsuccessful attempts made for the introduction of rattan cane seeds from the East during the last 30 years, a consignment of 3 varieties of that useful plant from Java gave this year excellent results and the seedlings are now being propagated in the Government reserves and on several estates in the colony.

Chalmoogra. The unique plant of *Taraktogenos* is 20 feet high after 3 year's growth and will soon come into bearing. The plants of *Hydrocarpus Anthelmintica* and *H. Wightiana* (about 150) are also doing very well especially at an elevation of about 600 feet at Nioi where they will soon also come into bearing.

Coffee. Robusta coffee has proved a success in many localities, one island producing already about 12 cwts per annum. Liberia coffee which at one time suffered so heavily from the green scale (*Lecanium viride*) has started bearing again heavily all over Mahé. The local demand for this coffee is better than for Arabian coffee from Aden and East Africa and robusta coffee obtained locally.

Vanilla. Vanilla is grown in a few localities only at Praslin where a drier climate causes the vines to flower more regularly. It is sufficient to mention that before the discovery of vanillin and its manufacture, a pod of vanilla was worth 20 cents of a rupee, and that it is now worth about one cent only in the Colony to explain why the culture of this plant has been given up. Only 970 kilogs were exported in 1931.

VIII.

Experimental Plots.

The question of manuring coconut plantations was taken up as far back as in 1903 when the methods employed in the East were explained to the planters after my visit to Ceylon, Malaya and Java in 1902. The substance of these methods together with a discussion as regards the amount of fertilizing elements that are removed from the soil in Seychelles were published in leaflet form and distributed to planters. The leaflet was afterwards reprinted in Paris (Challamel & Co.) in 1914 by the authority of the "Institut d'Agronomie Coloniale". Only one planter in 1907 started an experiment at Félicité Island but he unfortunately left the Colony soon afterwards not without communicating wonderful results to the Agricultural Board which went to show that the crop of nuts increased from 31 to 61 per tree by manuring with Kainit and cattle manure. It was not until 1916 that the Government authorized a vote of Rs 300 being granted for the establishment of experimental plots at Long Island which belongs to the Crown. It was not then considered advisable to waste Government money in manuring land belonging to private owners. The difficulty of establishing plots on the sloping land of that island was gradually surmounted by terracing the land by means of Prison labour. On account of these experiments was made in my annual reports for 1916, 1917, 1918, 1919 and 1920 which went to show that fish manure obtained locally at Rs 5 per 100 lbs and potash from ash and seaweeds were highly beneficial. The experiment was brought to an end when I left the Colony for Mauritius in 1921.

In 1926 soon after my return to the Colony the question of manuring was again taken up and Government approved the importation of 10 tons of Nitrate of Potash from India which was sold to planters at cost price. Only one planter at N. E. Bay went in for a careful experiment after which it was stated that Nitrate of Potash in conjunction with guano (complete fertiliser) had doubled the crop.

In 1930 chemical fertilizers were again imported and distributed to five planters at cost price, Government having acquired a loan for that purpose from the Colonial Development Fund's Committee. The financial position of the Colony very soon after became very critical owing to the slump on the coprah market and one of the planters who had given his name for the purchase of 1/5 of the fertilizers sold his estate, while the others owing to financial difficulties did not take their full share of the consignment. Another planter very favourably reported on the use of Nitrate of Potash in patchouli plantations. It is too soon to record the results obtained by the 3 other planters, but one of them at Anse la Mouche who took up manuring with 500 lbs per coconut tree of seaweeds or cinnamon refuse in trenches on the top of which 20 lbs of a mixture of Nitrate of Soda, Sulphate of Ammonia, Sulphate of Potash and

guano were spread, already thinks very highly of the results obtained. He succeeded in transforming a worn out plantation which had been dreadfully attacked by scales into a grove of trees which now looks healthy and luxuriant. He lately informed me that the mere act of trenching the ground and thereby draining it leads to a considerable improvement besides the good results obtained by loosening the subsoil which had remained root bound and hardpanned for centuries.

It is hoped to gradually dispose of what remains of that consignment of chemical fertilizers which are carefully stored at the Agricultural Department and to sell it for cash, bag by bag, the fertilizers being either mixed together to form a complete fertilizer containing 50/o Nitrogen, 90/o Potash and 140/o Phosphoric acid or sold separately when the financial position of the planters will have improved. The above fertilizers were sold to planters who have to pay back the advance, capital and interest after 7 years.

Soon after Mr Stockdale came to the Colony (February 1931) at a time when the financial conditions were even worse, he suggested that considering the uncultivated state of most estates, lack of drainage &c. it would be better to use organic manures only for the present Fish, guano, meat meal, cotton meal and phosphatic guano with or without green manuring. 20 planters have given their names for the proper establishment of experimental plots in various districts of the colony and this experiment will be started at the beginning of 1932.

It has been found necessary to spend a lot of time discussing the proper way of arranging experimental plots in conformity with the programme adopted by Mr Stockdale and to explain that an experiment which is not a scientific experiment is not an experiment at all. The planters here are in the secular habit of allowing a lot of jungle trees and bushes to grow between the coconut palms and to manure their estates with seaweeds and cinnamon refuse by digging trenches wide apart without cleaning or cultivating the ground. It will take some time to convince them to clean weed their experimental plots and dig in the organic manure but the necessity of adopting this policy is gaining ground, such also is that of counting the nuts on the trees before and pending the experiment.

Organic manures will in the long run be manufactured in the Colony as organic manures are too bulky for importation. This again will take time. More than 2,000 tons of cinnamon refuse are still found lying on the beach in many localities while on the whole only 6,000 tons are produced in the Colony. It will also be found necessary to use potassic fertilizers in the experimental plots as none of the organic manures imported contain that element which is also lacking in cinnamon refuse. Seaweeds and cinnamon refuse are of about the same composition as cattle manure. Cinnamon refuse contains however a little more lime, potash and phosphate originating from the ash derived from the furnace of the distilleries heaped up with the refuse. Seaweeds on the other hand contain 7 times more potash than cattle manure.

The question of green manuring has not progressed for two reasons. One is that without trenching the ground and manuring it with phosphates most introduced cover plants make very shy growth except in localities where alluvial soils washed down from the hills are sufficiently rich to allow a growth of either centrosema or Indigofera as at Cascade where centrosema has formed an excellent cover smothering the coarse weeds in the proper way. All the other introduced cover plants have not done so well except in manured grounds. The second reason is that as far back as in 1911 a wild plant, *Asystasia Coromandeliana*, was introduced from India and is now growing spontaneously. It succeeded so well all over the colony either in coral ground or in red soils that planters now consider it as the best available cover plant without bothering to make use of another; this *Asystasia* plant forming besides the best fodder plant known in the Colony. In the red laterites at the Botanic Station *Indigofera endecaphylla* has however given good results, covering the ground quite as well as the *Asystasia* plants. The latter plant is said also in British Guiana to be a good fodder particularly rich in mineral elements.

The dominant reason for which manurial experiments are not taken up more energetically by planters is the necessity of reducing their working expenses, so long as the price per thousand nuts will not exceed Rs 20 at present. Coconut estates in Mahé without manurial treatment give a profit of Rs 11.50 an acre with coconuts at that price. It is often forgotten that by manuring even at the cost of Rs 30 an acre the crop is doubled or trebled and that therefore any increase by manuring of the working expenses is made good by the supplementary crop. There is no other way of increasing the crop. Manuring is a paying proposition, otherwise it is not manuring at all. I for one do not believe in other reasons that are being put forward to claim the undesirability of making such experiments. 15 years ago, no cinnamon refuse was used, it was all left rotting on the beach or thrown into the sea but a time came when it was found that the heaps harboured larvæ of rhinoceros beetle which did havoc to estates in the neighbourhood. Legislation was passed to compel distillers to dig in their refuse and the practice of spreading it in patchouli plantations or digging it in trenches under coconut palms soon became established. The results were so good that manuring with cinnamon refuse now forms part of the routine work of most estates. The planters know beside quite well the results of manuring with cattle manure, seaweeds or cinnamon refuse nowadays as they all grow a small vegetable garden in which they all mix this organic matter with the garden soil pound per pound, so to speak.

Some of these planters indulge in theories that certain chemical manures such as Sulphate of Ammonia and others are conducive to bad results having been become acquainted with some facts published in scientific journals which the laymen can hardly understand without special training. They are apt to generalise special results obtained for example, in old red, sugar cane clayey soils by manuring with sulphate of ammonia for 50 years in succession. This hardly applies here where the soil is certainly acid in some places without the acidity being excessive in others but it is not well known as yet whether acid soils under certain conditions are not good for coconut palms. In the West Indies and in the East, Sulphate of Ammonia is giving excellent results. In Madagascar where the laterite derived from the same

granite is closely allied to ours if not absolutely similar, it has been found lately that planters of coffee, cacao, &c., prefer acid soils there than the others and that less acid soils occupied by pasture grasses following bush fires are now more devoted to certain short lived forest trees like Eucalyptus and acacias than to industrial plants. Much time is lost in discussing such academic matters although it is known that a coconut palm, when properly manured, often bears 60 nuts per annum in the Colony while the average hardly exceeds 16 nuts. Islands rich in guano deposits yield 10 times more nuts than in Mahé. This margin is rather great. We have not reached the time yet when discussion on the ill effect of manures should be discussed, provided that chemicals are not used except in conjunction with a heavy dose of seaweeds or cinnamon refuse. It will take a long time to show that the soils of the Colony are rich enough for the consideration of the effects of over manuring. In Seychelles we have first to improve the physical properties of the soil by adding humus, this would go far to promote reactions which are known to combat the ill effects of hydrates of iron and alumina which are so detrimental to plant growth by forming hardpans.

It has been reported to me that the use of cinnamon refuse year after year in many patchouli plantations under coconut lead to a drop in the yield of the palms and to their noteworthy diseased appearance. I am afraid that this again is a technical matter. It has been fully described lately in a document on green manuring (Technical communication No. 22 supplied by the Imperial Bureau of Soils (Rothamsted) in which the old well known theory that large heaps of organic matter poor in nitrogen that are left on the surface of the soil to be decomposed by the soil bacteria necessitate the multiplication of these bacteria on such a great scale that they make use of the Nitrogen existing in the soil itself at the beginning to build up their tissues, thus depriving the soil for some time of a fertilizing element which is however soon restored to it when the organic refuse has decomposed and nitrogen accumulated. The alleged ill effect therefore of this kind of manuring is quite illusory.

Every body knows that coconut palms set out now a days do not make the growth they did formerly. It is extremely difficult already to supply vacancies in most plantations. I am afraid that the crop of coconuts will collapse when the tall trees in bearing will have disappeared unless manuring is energetically resorted to.

IX. *Experimental work with silk worms.*

The Eri and silk worm industries have been long under consideration by this department but it is only at the end of this year that a small consignment of Silk worm eggs from Cyprus was received under the guidance of the Director of the Imperial Institute who kindly supplied at the same time much information which allowed this department to pull through the preliminary stages of the experiment.

The eggs arrived in fairly good condition and were placed in drawers in a kind of cupboard in the dining room of a bungalow and they soon started (15 days after arrival) to hatch out, a few at a time. The worms were fed on chopped mulberry leaves and started spinning their cocoons 30 days after they were born. The spinning of the cocoons was also completed within 12 hours and was found thus to be quicker than in European countries. The most suitable structure on which the worms were made to spin their cocoons was obtained from twigs of Bois Sagaie (*Maba Seychellensis*) which is a much branched shrub with leaves that are not shed from the branches on drying.

The other phases of the experimental work for the curing of the cocoons and the breeding of the moths for the local production of eggs still remain to be done. A portion of the eggs after they had commenced hatching out was delivered to Mr F. C. Savy of Bel Ombre who is also carrying on experimental work successfully. It is hoped that this cottage industry will be taken up by the wives and children of small settlers who once were experts in vanilla curing which is even more complicated than silk worm rearing. It has been found already that there is really no great difficulty ahead except that the mulberry trees have to be cultivated and manured to withstand scale insect attack and that constant attention is required for the proper feeding 4 or 5 times a day of these interesting insects. The yield of cocoons in one cottage is nothing but when a 1,000 cottages are combined the industry became profitable as in Cyprus and elsewhere.

The question of eri worm rearing on castor oil in Seychelles was not recommended by the authorities of the Imperial Institute owing mostly to competition with artificial silk which render unprofitable the exportation of eri worm cocoons. Silk from mulberry worms has withstood competition with artificial silk.

X. *Entomological and Mycological notes.*

A number of specimens were forwarded during the year to the Imperial Institute of Entomology and Mycology for identification. I am also indebted to Mr Frederic Laing of the British Museum and to Mr F. C. F. Fryer, Director of Phytopathological laboratory of the Ministry of Agriculture, for much assistance and advice.

The coconut plantations of the Colony are the prey of parasitic insects and fungi and it is much to be regretted that the Scheme under which it was decided at the Colonial Office to secure the services of a senior Officer of the farm house laboratory had to be abandoned for the present. There are many problems of parasitology here which have to be dealt with by a specialist on the spot. Small islands cannot be compared with continents as far as parasitological problems are concerned. However if plant diseases and pests due to poor soil conditions and lack of cultivation are frequent in oceanic islands, climatic and other factors seem to check these diseases in a rather uncommon way. On the sea side exposed to trade

winds plantations are very seldom attacked by the scale insects and this is attributed in many cases to the rather high salinity of the atmosphere. Above a certain altitude which varies in accordance with the amount of erosion of the land, the invasion of scale insects is at its worst and there the soil is too shallow and too exhausted to enable the eradication of the disease being made economically by methods of cultivation. In such places coconut planting has to be given up.

The damage done by the two scale insects *Ischnaspis filiformis* and *Pinnaspis buxi* is worse than ever. It has been found however that *Pinnaspis buxi* was much more parasitised by coccinellid beetles than *Ischnaspis* which is gaining ground without the *Pseudomicrocera* fungus now established holding it in check appreciably.

Sphaerostilbe coccidophthera together with *Pseudomicrocera henningsi* were identified at the Botanic Station in April on bushes of *Hibiscus mutabilis* attacked by *Aulacapis pentagona*. These red headed fungi are therefore established in the Colony and may help in keeping down other scale insects as well in future.

Pinnaspis minor was identified by Mr Laing in March 1931 on leaves of young coconut palms. This insect is different from *Pinnaspis buxi*. The other *Pinnaspis* (*P. Aspidistræ*) seems to prefer *Dracaenas* and *Heliconias* to other plants and does not attack coconut plantations. A moth was identified at the Imperial Institute of Entomology as *Phyata poberiella*. It was found on castor plants living on the stems and near the inflorescences. The damage it does is not great and this insect appears to be parasitised by an ichneumonid fly which has not yet been identified. The ravages of *Melittomma insulare* has subsided in all localities where the base of the coconut palms has been earthed up or walled in. In the South part of Mahé and in Praslin the same measures still neglected and the loss of full grown palms in bearing is still a common feature in those localities. The fungus *Ganoderma lucidum* has been identified in many places where *melittomma* prevails and it is a question whether the fungus does not prepare the ground for the beetle. The leaf bitten, the little leaf and budrot diseases are less frequent than formerly especially along the coast where manuring with cinamon refuse and seaweeds has been adopted.

XI. Livestock.

The successful introduction of a pair of Friesland cattle of S. African origin from Mauritius in 1930 has enabled this department to start the improvement of local breeds by cross breeding early in 1931. In July 1931 the heifer gave birth to a bull calf which at the age of 6 months is now considered by one and all as the best calf that has ever been reared in the Colony. It is the size of a local 12 months' calf. The bull has doubled its size during the last 12 months and its services were made available to stock breeders on payment of a fee of Rs 3 for each service. The heifer is also in good condition and was served for the second time in December 1931. It has been found difficult to part with the local system of allowing the calf to suck its mother at intervals for 12 hours a day but the dairyman has been trained to milk the cow twice a day and to prevent the calf from having access to the heifer in any way. On being milked once a day the cow produced from 7 to 9 bottles but the appearance of the calf is such that as much milk was apparently consumed by the calf. Steps are being taken to prevent such a wastage of milk after the birth of the second calf. The milk was supplied to the Hospital at 10 cents per bottle.

Towards the end of the year an epidemic of bacillary dysentery broke out and the patients were confined to a newly build ward at the Hospital which is within stone throw of the cow shed. The cow shed was for that reason pulled down and rebuilt further up in the gardens where the undesirable flies from the Hospital will be kept at a safe distance away.

There has been no difficulty in feeding the imported animals which took to the pasture grasses in such a wonderful way that even the very coarse weeds including citronella, used as litter, were consumed by the animals.

No arrangement was made as yet from want of funds for the establishment of a small dipping tank to rid the cows, that are brought from outside to the bull, of ticks and lice. This is however under consideration by Government as there is hardly a cow in the Colony which is not more or less suffering from these pests. On several occasions the imported stock was thus contaminated but the parasites were quickly destroyed by rubbing a mixture of coconut oil and camphor into the skin of the animals and also by using a decoction of tuba root.

The calf will probably be sold by auction as soon as it is old enough to have acquired all its qualities (at the age of 18 months) unless it is found desirable to have it stationed at Praslin for breeding purposes in that distant locality. Two more heifers have been ordered from Mauritius where they have already been selected and put under severe quarantine by the Agricultural Department of that Colony to which I am indebted also in many other ways.

Milk production in the Colony is a paying industry in many localities, the milk from country districts being brought to Victoria every day. This market seems however to become more and more glutted, the price per bottle having fallen from 15 to 10 and 12 cents during the year. Attempts were made by a planter of great ability and knowledge to manufacture butter and cheese during the year in a distant locality. The butter which was very good was not however appreciated by the public who still rely upon imported butter from India which is cheaper. The price paid for fresh butter was too low to warrant the planter in question continuing his operations although he acquired a good equipment including a Laval centrifugal machine. He was however able to sell butter at the same price as imported butter from Kenya which is also sold on a small scale in the Colony. Cheese manufacture was not a success owing probably to the lack of the necessary good ferments that should be introduced in future.

The educational work of butter and cheese making is however a necessity as cattle rearing on estates has to be extended and improved if the fertility of the land is to be maintained by manuring. The production of beef is out of question as the inhabitants live on fish and turtle almost exclusively.

There were no funds available during the year for the introduction of other breed of animals from S. Africa such as the black Head Persian sheep, pigs, ducks and poultry. The wild goats at Aldabra are becoming a nuisance as they have multiplied to such an extent that during periods of drought they bark the trees and prevent them from developing above a certain height. These goats are however known to produce milk of which many inhabitants in that group of islands take advantage by simply tying the kids in their yards where the mothers come to visit them while taking care of themselves in the jungle. This is an economic way of getting cheap milk and there is no reason why this system should not be extended and the milk in excess turned into ghee which is imported from India to the amount of over a ton $\frac{1}{2}$ a year.

It has not been possible to introduce pure bred Italian queen bees free from Acarine disease this year, the breeder having declined to forward the queen bees except by air route which is not yet available. It is hoped that this difficulty will soon be overcome.

XII. Fisheries.

The following articles from the Outlying islands were exported during the year as compared with the two previous years:—

	1929	1930	1931
Guano tons	12,781	15,997	4,730
Tortoise shell kilogs	995	1,335	963
Calipee	4,226	3,570	4,439
Shark fins	865	1,095	1,433
Trepangs	6,061	9,647	8,937
Green turtle shell kilogs	633	nil	nil
Salt fish	nil	"	1,100
Turtle strips	1,314	2,567	2,511
Birds' eggs (yolk & albumen white)	29,170	84,227	102,150
Fresh fish	1,043	nil	nil
Turtle oil litres	nil	4,225	"
Shark meat	"	nil	350
Shark oil litres	"	"	170
Shark skins	"	"	300

The above table shows that the fisheries are being gradually developed in this Colony although many schemes that have been elaborated for the cold storage of fresh fish have had to be postponed until the financial position of this colony becomes better.

Reference has already been made to the preparation of birds' eggs and their conversion into preserved yolk and white albumen of which 102 tons were exported during 1931. This is altogether a new industry which was gradually brought into shape by Mr L. E. Lanier who together with Mr Dunlop Stewart are practically the only residents who have realised that its vast marine resources have as yet hardly been touched and that the financial and agricultural position of the whole community would be singularly improved if a market could be found for fresh and salt fish and for fish guano, and fish meal, fish oil, and glue prepared in the colony. Marine resources unlike agricultural products can be tapped without waiting a long time for the harvest.

The birds' eggs are those of the sooty tern (*Sterna fuscata*, Linn) which is distributed all over the Tropical and Sub-tropical Seas (except the Pacific Coast of South America). On the West Coast of Africa its habitat extends from Senegal to Fernando po and on the East Coast from Aden to Tanganyika. It breeds at Ascension, St Helena and the Mascarene islands.

The passing of the fisheries ordinance No. 7 of 1929 has gone far to restock the reserves of Mahé which had so much been depleted in the past. Evidence of this can be found in the shoals of Carangue balo (*Caranx gymnotethoides*) which now visit during the season the inner harbour of Victoria right along the esplanade to prey upon the more abundant fry of all sorts of fish which now breed to a larger extent than formerly on the coast. On the market price per lb of fish has been reduced by 25 o/o and even by 50 o/o in some cases and the fish sold have increased considerably in size. When one thinks that more than 2,000,999 lbs of fish are consumed in the colony per annum, one can say that the protective measures adopted including the regulating of the meshes of nets and fishing baskets have had a considerable influence on the diet of the inhabitants. The greater abundance of small inshore fishes will naturally lead to an increase in the amount of the offshore and migratory fishes which visit the coast and which therefore will be more easily captured. The use of the long nets up to 500 metres is forbidden in the reserves. This restriction has been extended this year by law to Anse a Mouche Bay where the occasional use of the long net inside reefs went far to deplete this narrow bay from smaller fish which were daily captured in basket traps by the inhabitants of this populated district. Every resident along the coast is in possession of one or several basket nets and small nets for which no licence is paid for. The question arises as to whether a small licence should not be paid as here as residents who are in possession of

dozen traps or more with the result that during the breeding season these basket nets & small nets are full of eggs of cordonnier (*Tenthis* spp.) and other fish of undersized fish mostly eclair (*Lethrinus* *Karwa* and *opercularis*).

The lease of the Aldabra group of islands expired in August 1931 and provision has been made to lease henceforward the 3 islands of Aldabra, Assumption and Cosmoledo independently from one and another in order to secure a better exploitation of their respective resources.

XIII. Crown Lands.

The following plants were set out during the year at Niol, 2 in the Botanic Gardens, (3) in the coco de mer reserves at Praslin.

1. Niol Crown Lands.

Fruit trees (mostly selected varieties): Oranges avocados; Mangoes				
Mangosteen; Litchi Rambutan	...	...	...	415
Nutmegs (<i>Myristica fragrans</i>)	...	...	...	30
Sangdragons <i>Pterocarpus indicus</i>	...	...	...	700
Hamboyant (<i>Poinciana regia</i>)	...	...	...	140
Neroli (<i>Citrus Bigaradia</i>)	...	...	...	150
Pimento officinalis (all spice)	...	...	...	400
Heritiera littoralis (Bois de table)	...	...	...	150
Mimusops elengi	...	...	...	75
Albizzia moluccana	...	...	...	130
Coco de mer (<i>Lodoicea Seychellarum</i>)	...	...	...	120
Parkia Roxburghii	...	...	...	100
Acacia confusa	...	...	...	300
Eucalyptus (Mauritius hybrid)	...	...	...	150
Palms including Talipot and Raphias	...	...	...	480
Terminalia catappa	...	...	...	100
Kapok (<i>Eriodendron anfractuosum</i>) Java seeds	...	...	...	250
Berrya amomilla	...	...	...	160
Clove (<i>Carvophillum aromaticum</i>)	...	...	...	960
Cocoplum (<i>Chrysobolanus icaco</i>)	...	...	...	10,000
Calophyllum parviflorum	...	...	...	250
Santol (<i>Sandoricum Koltjapi</i>)	...	...	...	200
Casuarina equisetifolia	...	...	...	300

2. Botanic Gardens.

Coco de mer (<i>Lodoicea Seychellarum</i>)	...	...	...	21
Nutmeg (<i>Myristica fragrans</i>)	...	...	...	35
Cocoa (<i>Theobroma cocoa</i>)	...	...	...	28
Rambutan (<i>Nephelium lappaceum</i>)	...	...	...	12
Mimusops elengi	...	...	...	6
Copal (<i>Trachylobium verrucosum</i>)	...	...	...	8
Coconut dwarf	...	...	...	12
Acacia confusa	...	...	...	91
All spice (<i>pimento officinalis</i>)	...	...	...	82
Eucalyptus citriodora	...	...	...	75
Avocado pears (<i>Persea gratissima</i>)	...	...	...	11
Aleurites montana (Tung oil tree)	...	...	...	24
Agave cantala	...	...	...	24

3. Praslin reserves (coco de mer valleys).

Nutmeg (<i>Myristica fragrans</i>)	...	...	...	50
Eucalyptus hybrid	...	...	...	100
Azalia bijuga	...	...	...	300
Cacao	...	...	...	50
Coffee	...	...	...	50
Calophyllum parvifolium	...	...	...	780
Pimento officinalis (all spice)	...	...	...	67
Borassus flabelliformis	...	...	...	100
Bigarades (<i>citrus bigaradia</i>)	...	...	...	100
Orange and other fruit trees including the so called Persian orange	...	...	...	50
Java Kapok	...	...	...	1,800
Tecoma leucoxylo	...	...	...	336
Cinnamonum zeylanicum	...	...	...	234
Coco de mer	...	...	...	598
Areca nuts	...	...	...	346
Mimusops elengi	...	...	...	6
Aleurites montana	...	...	...	2

The re-afforestation of the Crown Lands at Niol above Victoria was started in 1912 in order to maintain the mountain summits under wooded conditions thus enabling rainwater to percolate down to the coconut plantations on the coast and regulate the courses of the streams leading to the Niol reservoir. It may be interesting to record that these crown lands acquired mostly by exchange were abandoned estates that had been worn out by shifting cultivation and bush fires. A conflagration in 1920 originating from bush fires on a neighbouring estate swept out many plantations already made mostly young seedlings of capucin, Butter tree, *Pentadesma butyracea*, mangosteen (*Garcinia mangostana*) and casuarinas. In 1927 a piece of land of 160 acres (Terrain Turpin) was acquired in order to extend the reserves in such a way as to include a few more sources of the principal rivers of the Colony and diminish the risks of conflagrations which so often break out in the neighbourhood. The burnt areas were tackled at once there was not much soil left on them but by setting out *cocoplum* in rows at right angles to the slopes and afterwards planting hardy species such as *Tecoma leucoxylon*, *Sandoricum* (Santol) *Trachylobium verrucosum*, *Acacia confusa*, *Albizzia moluccana*, a canopy was gradually established which stamped out the growth of coarse weeds and bracken ferns (*Gleichenia dichotoma*). *Casuarina equisetifolia* gave poor results and remain stunted under the poor soil conditions and high elevations. In the valleys *Sangdragon* (*Pterocarpus indica*) both from seeds and cuttings did well with an undergrowth of *cocoplum*. Streams which formerly dried up entirely in these ravines show at present a more constant flow of water towards the Niol reservoir. Gum Copal (*Trachylobium verrucosum*) and *Tecoma leucoxylon* produce a better capacity than other trees in a shorter time and are thus very instrumental in killing out fern and weeds.

One of the difficulties attending the reafforesting of these reserves was the fact that they were leased for the exploitation of cinnamon (leaves and bark) from 1920 to 1927 and that most of the plants set out in the jungle were trampled down or otherwise injured by the labourers engaged in exploiting cinnamon. Many cinnamon bushes died out having been stripped of their bark while standing and the result was that the coarse weeds and bracken ferns on being relieved from the shade started growing again at such a rate that many young plantations made became thorough handicapped by them. The work of clearing had in short to begin over again but steps have been taken to prevent these Crown Lands being leased any more.

The destruction of bracken fern is not difficult when these plants have been left growing wild a long time because they are then no longer growing in close proximity with the ground from which they are separated by a thick mattress of dead stalks and roots. It is in this new bed of vegetable matter more or less decayed that the ferns become more and more rooted. By using a long knife and cutting into these dead roots a large area of bracken can be destroyed at a time without the ground becoming re-infested with them. On the other hand when the ferns are young and rooted in the ground one has to dig into the soil to remove young seedlings which are provided with powerful underground runners for propagation. The runners are not present in the mattress of old roots. It naturally follows that one has to be on the look out to avoid large plantations becoming overgrown with bracken, especially in the young stage of growth.

A carpet grass (*Panicum parvifolium*), introduced it appears in the 80's, which was formerly common on the hills have now spread over the low country in coconut and cinnamon plantations with the result that the soil moisture and aeration are considerably depleted and altered, the grass being mistaken for lawn grass and dealt with too late when all the estate is infested. This carpet grass is in many cases also a serious obstacle when the reafforesting of barren areas is under consideration.

XIV. Excise Returns 1931

The area under sugar cane cultivation and for which a tax of Rs 250 per acre has to be paid amounted to 14.6 acres and 1219 sq. ft distributed as follows:—

	Acres.	10ths	sq. f
North District ...	7	9	539
South „ ...	5	2	1,522
Praslin ...	1	4	3,444
La Digue ...	...	...	257

compared to 20.9 acres—, 1,765 sq. ft. in 1930 and 26 acres—1,375 sq. ft in 1929.

The number of bacca mills during the year amounted to 10 and 14 licences were issued to retailers of bacca.

Compared to 82 in 1930, the number of essential oil distillers for the year under review amounted to 38, owing to the heavy fall in the price of cinnamon leaf oil.

As anticipated the blow given to this industry by the fall in price due to the competitive manufacture of Eugenol from Guaiacol and Safrol was so decisive that half of the distilleries closed down. To avoid the abandonment of this industry and to relieve to a certain extent those engaged therein, the amount for the licence fee was brought down from Rs 60 to Rs 20 per annum.

Financial position.

The total expenditure amounted to Rs 2,582 and the revenue derived from the taxes and licences were :—

Sugar cane plantations (Rs 250 p. a.)	...	...	Rs 3,674.38
Bacca mills (Rs 100 p. a.)	...	...	" 1,000.00
Tax on mill oxen (Rs 6 p. a.)	...	...	" 60.00
Tenders for licences	...	...	" 7,180.00
Bacca shop licences (Rs 180 p. a)	...	...	" 2,520.00
Essential oil distilleries	...	...	" 1,520.00
Total			Rs 15,954.38

compared to Rs 13,910.30 in 1930 and Rs 18,038.50 in 1929.

The figures for 1930 do not include Rs 6,570 representing the amount for tenders collected for bacca licences.

P. R. DUPONT,
Director of Agriculture.

14th March, 1932.

Financial Statement

The total cash disbursements for the year ended 1929 are as follows:

Salaries and wages	...	...	...
Interest on bonds	...	...	...
Interest on notes	...	...	...
Interest on mortgages	...	...	...
Interest on debentures	...	...	...
Interest on other securities	...	...	...
Interest on cash	...	...	...
Interest on other assets	...	...	...
Interest on other liabilities	...	...	...
Interest on other income	...	...	...
Interest on other expenses	...	...	...
Interest on other items	...	...	...

Total ... \$1,154,488

Amounts for 1929 in 1929 and 1929 are \$1,082,000 and \$1,082,000 respectively. The amounts for 1929 do not include the amounts for 1929.

T. H. W. W. W.
Director of Agriculture

1929 January 29

